

RABIES

PUBLIC HEALTH AND WELFARE TECHNICAL BULLETIN

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1. Definition--Rabies (Hydrophobia) is an acute fatal encephalitis characterized by deranged consciousness and paralysis. The virus is filterable and, with few exceptions, is transmitted only by the bite of a dog.

2. History--Rabies is world-wide in distribution in dogs, cats and carnivores in general--wolves, foxes, coyotes, and it is transmitted to herbivorous animals, and man, by the bites of these animals. The frequency of the disease is in direct proportion to the efficiency of the sanitary regulations of the community.

3. Etiology--Rabies Virus is most readily found in the brain and medulla of animals dead of the disease, and it may be present in the lachrymal glands, udder, testicles, and kidneys. In the living animal it is present in the salivary glands and saliva from one or two days before symptoms appear until death. The presence of Negri bodies in the hippocampus is pathognomonic of the disease. Cultivation and isolation of the virus has not been accomplished, and the nature of the Negri bodies has not been determined. The virus is highly resistant when dried quickly in nerve tissue; it succumbs quickly to putrefaction, and retains its virulence for a long time in glycerine. A mouse inoculation test devised in the laboratories of the Rockefeller Institute is said to be a more reliable detector of rabies virus than the Negri body test.

4. Mode of Infection--Transmitted to animals and man only by the bite of an infected carrier.

5. Pathology--The only characteristic lesions are microscopic. The most important from the standpoint of early diagnosis are the Negri bodies in the cytoplasm of the large nerve cells; these are sharply defined round or oval structures that are most abundant in the cells of the hippocampus major; they are also present in the cells of the cortex of the cerebrum and cerebellum and the spinal ganglia. Other lesions in animals that have died of rabies, but are absent in the early stages, are changes in the peripheral cerebro-spinal ganglia. These consist in the destruction of the normal large nerve cells, which are replaced by small round cells.

In animals that have died of rabies the Gasserian ganglia may disclose lesions that are characteristic, but not pathognomonic,

of the disease. An inflammation of the capsule of the ganglia cells leads to the replacement of these cells by those arising from inflammatory process - leucocytes, epithelioid, lymphoid, and mast cells. Similar changes occur in dog distemper, while they may be absent in the early stages of rabies. These lesions are of diagnostic value when the brain has been destroyed by injury or putrefaction.

6. Incubation Period--The incubation period is relatively short when the wound is located near the central nervous system, as on the face and head, when it is a deep puncture, when the tissues are rich in nerves and lymphatics, when the virus is rich in virulence and quantity, and in young animals or children. Bites on the lips and nose are especially dangerous.

Only a limited number of those bitten by rabid dogs become affected by the disease; this is estimated in man at 15 percent and in animals at from 20 to 30 percent.

The average period of incubation for man and different species of animals is: Dog, 3 - 6 weeks; horse and cow, 2 - 10 weeks; sheep and goat, 3 - 4 weeks; swine, 2 - 3 weeks; man, 3 - 9 weeks.

7. Symptoms--There are two distinct signs of rabies: Deranged consciousness and paralysis. The symptoms vary somewhat in different species and individuals. Occasionally the initial period of deranged consciousness is missing; the animal merely shows paralysis, dumb rabies, in contrast to the more furious form. There are three distinct stages that mark the typical course:

a. Premonitory Stage--in which the dog is depressed, restless, irritable, and avoids association with people. Increased reflex irritability may be shown by increased friendliness to acquaintances and a tendency to bite strangers. There may be a perverted appetite, manifested by refusal of food, and licking or eating all manner of indigestible substances, such as straw, dirt, wood, stones, glass, etc. Intense itching, with licking or biting of the part, may develop at the seat of the bite; this is most often observed in horses. At times the appearance of the animal may be apparently normal.

b. Stage of Excitement--This is characterized by excitement, restlessness, and vicious or aimless attacks on any moving object or biting other dogs, cattle, or any animal that crosses his path. Infrequently the special object of the rabid dog's attack may be an animal with which it has been closely associated. In cattle, this period has been marked by bellowing, tenesmus, and clonic spasms, such as jerking movements of the legs. Dogs may show hallucination by snapping at imaginary flies. There is also a marked change in the sound of the bark of a rabid dog; it has been described as a hoarse howl. This stage lasts for three or four days, and towards the end paralytic symptoms appear.

c. Paralytic Stage:

- (1) In the dog the usual early paralytic signs are drooling and an open mouth, caused by paralysis of the lower jaw; in localities it is commonly called "drop-jaw disease". Other early symptoms are ptosis, strabismus, staring expression, and inability to swallow. Efforts to swallow cause spasms of the throat muscles, a reasonable explanation for the "hydrophobia". After paralysis once appears, it develops rather rapidly, soon involving the body, hind parts, tails, bladder and rectum, and terminating fatally in exhaustion on the fifth to the eighth day after the onset of the first symptoms. In the paralytic form, without previous excitement, the attack is fatal in the second or third day. In the later stages, there may be a medium grade fever and a rapid pulse.
- (2) Cats--present symptoms much like those in the dog, except there is less tendency to wander.
- (3) Horse--the first symptoms is an intense itching of the bitten place (lips, nose), which causes extreme rubbing. Fear and restlessness are obvious. The animals stare, paw, and grab at the manger with the teeth, and move the ears continually. With the development of mania the horse attacks other animals and man, and may direct the attack against some particular individual. The periods between such attacks are variable. As in other species, diagnosis in the early stages may be difficult because of absence of excitation. Finally, paralysis is general, the end coming on the fifth to eighth day, as in the dog.
- (4) Cattle--are restless, excitable, and aggressive, though at first these symptoms may be intermittent and somewhat indefinite. They stand in one place, raise and lower the head, retract the upper lip, bore with the horns, and show clonic spasms of the muscles of the limbs by sudden jerking movements of the legs. There may be periodic attacks of excitement when they exert every effort to break loose from the stanchion; between such spells they are apparently normal. In most cases there is a prolonged hoarse bellow. They rub, bite, salivate, and grate the teeth. The digestive symptoms are anorexia, suspended rumination, tympany, inability to swallow, and impaction of the rumen with extreme straining.

The tympany and other symptoms of choke have led to suspicion of a foreign body in the throat with a consequential manual exploration, laceration of the hand, and a badly frightened subject for Pasteur treatment. The initial paralysis is in the throat or hind parts, leading to death in the usual time.

(5) Sheep---the symptoms are similar to those in cattle, though excitement is often wanting. Excitement is manifested by restlessness, stamping the feet, and marked sexual desire shown by riding other animals. Gnawing and licking of the wound are common.

(6) Swine---attack other animals, even their own young, when excited. They hide in the straw, gnaw at the wound and soon become paralyzed.

8. Course and Prognosis---The usual course is from four to seven days. Ten days is set as the limit beyond which a dog sick of rabies cannot live. Recoveries have been reported, even of dogs whose victims die of rabies, but such terminations are extremely rare.

9. Diagnosis---The clinical diagnosis is not difficult if the course has been typical and the observation complete. In dogs the changed attitude, aimless wanderings, unprovoked attacks, and rapidly fatal course, are almost pathognomonic. The paralytic or dumb form may be confused with other forms of encephalitis. The dropped lower jaw and changed voice are especially significant. Added to these are the negative autopsy findings with the presence of unusual foreign material in the stomach. Suspected animals should not be destroyed; if at the end of two weeks the animal is alive and well, the possibility of rabies may be dismissed.

The presence of Negri bodies in smears of brain tissue is positive evidence of rabies. For laboratory examination for Negri bodies, ship the entire head well packed in ice, or the brain preserved in glycerin. A negative result is not entirely conclusive; if the animal has been killed in the early stages of the disease they may be absent; though usually they are present. This is the most rapid and reliable method of diagnosis of rabies.

Habel's Inoculation Method: Inoculation of rabbits, guinea pigs or white Swiss mice is a satisfactory method of demonstrating the presence of virus in infected brain tissue. Characteristic symptoms rarely develop in 10 to 14 days, and vaccination should begin within a week following the bite. For inoculation one may use a part of the medulla ground up in distilled water; this suspension may be injected intracranially, sudurally, or intramuscularly. Inoculation is followed in two or three weeks with the dumb form of the disease.

10. Control--Little can be added to the eradication procedure as "the eradication of rabies infection resolves itself into two procedures. (a) The destruction of all ownerless and vagrant dogs, and (b) the muzzling of all dogs that appear upon the streets or in public places. In thus preventing the propagation of the virus, the disease will be practically exterminated.

Where rabies is present in a community all dogs owned by persons living in that area should be vaccinated once each year. A metal tag showing the year the vaccine was administered should be attached to the collar of the dog. A certificate describing the dog and giving the date of vaccination should be given to the owner of the dog and a duplicate filed in the office of the Health Center.

When a case of rabies occurs among animals in a community, all dogs if not vaccinated, should be done so at once and kept muzzled or on a leash until one month after the termination of the last case.

A dog or animal with the history of having bitten an individual should be held in quarantine for a period of fourteen days, and an animal which has not bitten an individual, but may be classified as a suspect, will also be quarantined for the same period and daily observations made. At the termination of the quarantine period, the animal should not be destroyed, if normal, and return to its owner should be effected. If suspicious symptoms develop, then with the owner's consent, the animal should be destroyed and the head submitted to a laboratory for examination.

11. PERTINENT FACTS CONCERNING RABIES IN JAPAN

a. Prevalence--In comparison with the United States, rabies is not prevalent in Japan. Rigid quarantine regulations and anti-rabic inoculations have kept the incidence at a low level.

The number of cases reported in 1946 was 19. No records were kept during the war period, but in 1938 the number reported was 6 (4 in Tokyo and 2 in Hyogo Prefecture). No extensive outbreaks have ever occurred in Japan and in 1921 the disease was completely eliminated.

It is anticipated that the number of cases will increase in 1947 due to a cessation of the immunization program during the war and the increase in stray dogs resulting from destruction of homes and shortage of food.

b. Control Measures--In compliance with Memorandum to the Japanese Government, AG 728 (30 Oct 45)PH, SCAPIN 214, subject, Information on Japanese Animal Disease Control, the Ministry of Health and Welfare issued the following instructions for the control of rabies:

- (1) Immunization of all dogs once each year.
- (2) Manufacture and distribution of an improved immunizing agent.
- (3) Preparation of adequate records for appraisal of results obtained.

c. Japan Control Laws--The Japanese Infectious Disease Control Law for Domestic Animals grants Prefectural Governors the authority to order immunization of dogs and enforce control measures against rabies.

d. Vaccine--Sufficient Japanese vaccine is now available. Distribution is controlled by the Ministry of Health and Welfare.